

In the Claims

Claims pending in the application are as follows:

1 1. (Previously presented) A method of removing contaminant particles from an
2 article surface comprising the steps of:

3 providing at least two fluids of differing densities such that a fluid interface exists
4 between each fluid;

5 providing an article with one or more contaminant particles on a surface of the article
6 having a greater affinity or solubility to one of the at least two fluids;

7 positioning the article into one of the at least two fluids; and

8 removing one or more of the contaminant particles on the article surface by passing
9 the article through at least one fluid interface vertically, horizontally, or at any
10 other orientation.

1 2. (Previously presented) The method of claim 1 wherein in the step of providing an
2 article with a contaminant particle on the surface of the article having a greater affinity or
3 solubility to one of the at least two fluids, the one of the at least two fluids having a
4 greater affinity or solubility to the contaminant particle has a higher density than another
5 of the at least two fluids.

1 3. (Previously presented) The method of claim 2 wherein the step of providing at
2 least two fluids of differing densities comprises providing water and chloroform such that

the contaminant particle will remain in the water when the article is passed through the fluid interface into the chloroform and further including the step of removing the water prior to removing the article.

4. (Previously presented) The method of claim 1 wherein in the step of providing an article with a contaminant particle on a surface of the article having a greater affinity or solubility to one of the at least two fluids, the one of the at least two fluids having a greater affinity or solubility to the contaminant particle has a lower density than the other of the at least two fluids.

5. (Previously presented) The method of claim 4 wherein the step of providing at least two fluids of differing densities comprises providing water and ether such that the contaminant particle will remain in the water when the article is passed through the fluid interface.

6. (original) The method of claim 1 wherein the step of providing at least two fluids of differing densities includes providing a pressurized gas.

7. (Previously presented) The method of claim 1 wherein the step of removing the contaminant particle comprises etching the contaminant particle on the article surface by positioning the article in the fluid having a greater affinity or solubility for the contaminant particle, such fluid being denser than another of the at least two fluids.

1 8. (Previously presented) The method of claim 1 further including the step of
2 terminating the removing step by extracting the article through the fluid interface into
3 another of the at least two fluids having substantially no affinity to the contaminant
4 particle.

1 9. (Previously presented) The method of claim 1 further including the step of
2 terminating the removing step by removing one of the at least two fluids having
3 substantially no affinity to the contaminant particle.

1 10. (Previously presented) The method of claim 1 wherein in the step of providing an
2 article with a contaminant particle, the contaminant particle having a greater affinity or
3 solubility to a fluid having a higher density than another of the at least two fluids, and
4 wherein the step of positioning the article into the at least two fluids comprises
5 positioning the article into the at least two fluids with agitation or energy input which is
6 periodic in time, or any combination thereof and further including the step of ceasing the
7 agitation and passing the article through the fluid interface.

1 11. (Previously presented) The method of claim 1 wherein the fluids are mixed at an
2 elevated temperature and further including the steps of ceasing the mixing at an elevated
3 temperature and cooling the fluids such that the fluid having a higher density with an

4 affinity for the contaminant particle settles and passing the article through the fluid
5 interface.

1 12. (Previously presented) A method of removing a contaminant particle from a
2 workpiece surface comprising the steps of:

3 providing a reaction vessel having a first inlet/outlet means located at a bottom of the

4 vessel and a second inlet/outlet means located above the first outlet means;

5 providing a first fluid into the reaction vessel;

6 providing at least one other fluid into the reaction vessel, the at least one other fluid

7 having a higher density than the first fluid such that a fluid interface exists between

8 the first fluid and the at least one other fluid;

9 providing a workpiece having a surface contaminant particle having a greater affinity

10 or solubility to either the first fluid or the at least one other fluid;

11 submerging the workpiece into the reaction vessel having the first fluid and the at least

12 one other fluid such that the workpiece is below the fluid interface;

13 removing the surface contaminant particle by passing the workpiece through the fluid

14 interface; and

15 terminating the removing step.

1 13. (original) The method of claim 12 further including the step of providing another
2 fluid into the reaction vessel having a different density than either the first fluid or the at
3 least one other fluid.

1 14. (Previously presented) The method of claim 12 wherein the step of providing a
2 workpiece having a surface contaminant particle comprises providing a workpiece having
3 a surface contaminant particle having a greater affinity or solubility to the first fluid and
4 the step of submerging the workpiece into the reaction vessel comprises positioning the
5 workpiece in the at least one other fluid layer such that during the step of removing the
6 surface contaminant particle, the surface contaminant particle remains in the first fluid
7 layer.

1 15. (Previously presented) The method of claim 12 wherein the step of providing a
2 workpiece having a surface contaminant particle comprises providing a workpiece having
3 a surface contaminant particle having a greater affinity or solubility to the at least one
4 other fluid and the step of removing the surface contaminant particle comprises passing
5 the workpiece through the fluid interface into the at least one other fluid layer such that
6 the surface contaminant particle is removed with the at least one other fluid layer.

1 16. (Previously presented) The method of claim 15 wherein the removing step
2 comprises lifting the workpiece through the fluid interface into the first fluid which has
3 substantially no affinity for the surface contaminant particle.

1 17. (Previously Amended) The method of claim 12 further including the step of
2 heating the first fluid and at least one other fluid into solution after submerging the

3 workpiece into the reaction vessel such that upon cooling, the first fluid and the at least
4 one other fluid are immiscible with the fluid interface present and the workpiece is
5 substantially present in only one of the fluids.

1 18. (Previously presented) The method of claim 12 further including the step of
2 agitating the first fluid and the at least one other fluid after submerging the workpiece into
3 the reaction vessel such that upon ceasing agitation, the first fluid and the at least one
4 other fluid are immiscible with the fluid interface present and the surface contaminant
5 particle is present in only one of the fluids.

1 19. (Canceled)

1 20. (Previously presented) The method of claim 12 wherein the step of removing the
2 surface contaminant particle comprises etching the surface contaminant particle from a
3 surface of the workpiece and wherein the step of terminating the removing step by
4 passing the workpiece through the fluid interface comprises a rapid etch stop.

1 21. (Previously presented) The method of claim 13 wherein the step of terminating the
2 removing step comprises removing the first fluid from the reaction vessel.

1 22. (original) The method of claim 12 wherein the steps of providing a first fluid or the
2 at least one other fluid comprises providing a pressurized gas.

1 23. (Previously presented) A method of removing contaminant particles from a
2 workpiece surface comprising the steps of:

3 providing a reaction vessel containing water;

4 providing at least one fluid having a different density than the water such that
5 predominant fluid layers and a water layer exists with a fluid interface between
6 each fluid layer and the water layer;

7 providing a workpiece having surface contaminant particles;

8 passing the workpiece through the at least one fluid interface; and

9 removing the contaminant particles from the workpiece surface as the contaminant
10 particles remain in the water layer.

1 24. (Previously presented) The method of claim 23 further including the step of
2 removing the water layer from the reaction vessel when the step of removing the
3 contaminant particles is completed if the workpiece is positioned below the water layer.

1 25. (Currently amended) A method of ~~removing a surface contaminant particle from a~~
2 ~~workpiece surface~~ etching a layer form a surface of a wafer comprising the steps of:

3 providing an etchant fluid;

4 providing at least one fluid immiscible with the etchant fluid having a different density
5 than the etchant fluid and forming a fluid interface therebetween;

6 positioning a ~~workpiece~~-wafer in the etchant fluid to facilitate etching of a ~~surface~~
7 ~~contaminant particle~~layer on the ~~workpiece~~wafer; and
8 terminating etching of the ~~surface~~-~~contaminant particle~~wafer when the ~~workpiece~~
9 wafer is passed through the fluid interface into the at least one fluid immiscible
10 with the etchant fluid.

1 26. (Previously presented) The method of claim 25 wherein the step of providing at
2 least one fluid immiscible with the etchant fluid comprises providing two fluids
3 immiscible with the etchant fluid, both fluids having a lower density than the etchant fluid
4 and immiscible with each other such that a first fluid interface exists between the two
5 fluids and the etchant fluid and a second fluid interface exists between the two fluids.

1 27. (Currently amended) The method of claim 26 wherein the step of terminating
2 etching of the surface ~~contaminant particle~~layer comprises passing the ~~workpiece~~-wafer
3 through the first fluid interface into one of the two fluids.

1 28. (Currently amended) The method of claim 26 wherein the step of terminating
2 etching of the surface ~~contaminant particle~~layer comprises drawing the ~~workpiece~~-wafer
3 through the first fluid interface to provide a rapid etch stop and further including the step
4 of passing the ~~workpiece~~-wafer through the second fluid interface such that a protective
5 coating is formed on a surface of the ~~workpiece~~wafer.

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1 29. (canceled)

1 30. (canceled)